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BIOLOGY AND NATURAL CONTROL OF THE GREEN CITRUS APHID APHIS SPIRAECOLA PATCH[1]

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State Plant Board,
Sanford, Fla.

BIOLOGY

Identity.—The name of the green citrus aphid is somewhat in dispute. It was first described by Dr. Edith M. Patch in 1914, but in a later paper Dr. Patch stated that it was probably identical with *Aphis pomi*. Dr. A. C. Baker, however, states that a difference occurs in the male forms (*Aphis pomi* being wingless and *Aphis spiraecola* winged) and for this reason the species should not be considered identical.

Appearance in Florida.—Altho there are indications of the presence of this aphid in Florida as early as the autumn of 1922, it was not until 1924 that its identity was definitely determined by Dr. A. C. Baker. It first appeared near Tampa, Florida, and from there spread eastward over the entire state with great rapidity. Since this is the direction of prevailing winds, it is assumed that the insect was thereby distributed. It is now found in Florida, California, Alabama, Cuba and Honduras.

Host Plants.—Considering the two species identical, Dr. Patch gave some 47 host plants. In Florida it was found to feed on some 30 plants, but thrives only on a few, namely, citrus,

[1]The purpose of this paper is to give a summarized report of two years' work with the citrus aphid carried on at the Citrus Experiment Station at Lake Alfred, Florida, during 1926 and 1927. All phases of the problem were studied and all available literature concerning this aphid was consulted.

The writer is greatly indebted to the Entomologist and Director of the Florida Experiment Station, his advisors at the Ohio State University and several men of the Bureau of Entomology, United States Department of Agriculture, for their aid, suggestions and encouragement during the progress of the work.

spiraea, apple and milkweed.[2] Only very tender growth of citrus and apple are attacked, but in the case of spiraea the aphid can survive on quite tough, hard foliage or even on tender stems.

Seasonal Appearance.—The seasonal appearance of the pest is shown on the chart. Fig. 1.

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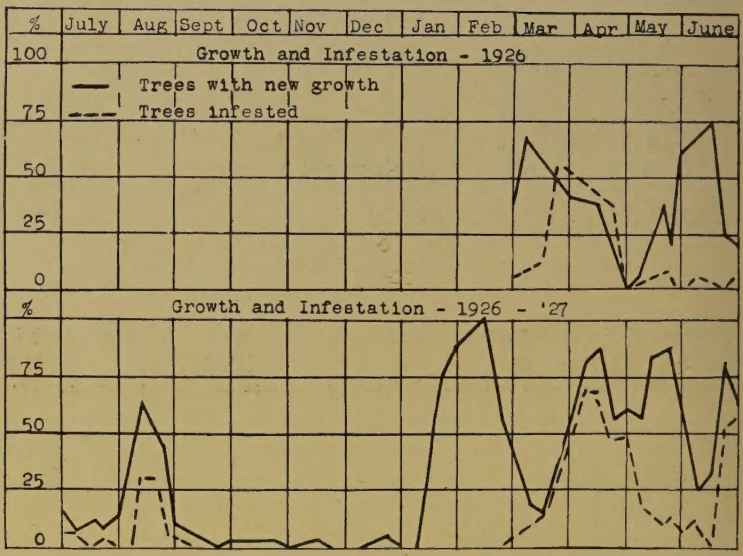
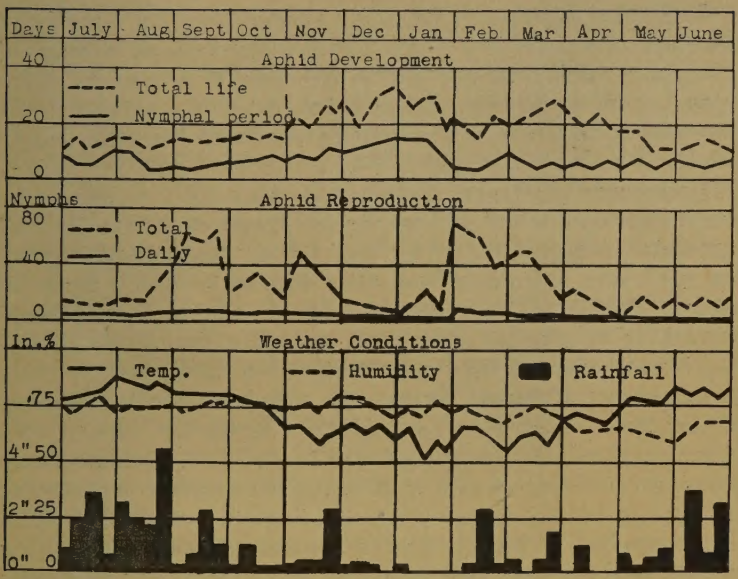


The winged forms become most abundant during March, usually 7-14, and the migration then takes place. A very great number of plants are attacked and a few generations completed there, but by June the aphid can usually be found on only a few plants again. These are citrus and spiraea.

Life History.—The life history of the green citrus aphid at Lake Alfred, Florida, differs from that of the same aphid in the north in that no sexual forms were found at this southern station. Consequently no eggs have ever been observed at the Citrus Experiment Station in Central Florida. The insect passes the entire year in the active stage and from August, 1926, to August, 1927, passed through 44 successive first born generations and 20 last born generations. At Gainesville, Florida, both

[2]During the past summer it has in places been found in large numbers on the tender growth of Pittosporum.—Ed.



sexual forms and eggs have been found and there the life cycle is very similar to that in more northern climates. The eggs were found on spiraea, apple, pear, and Japanese flowering quince.[3]

The average time to mature or nymphal period ranged from 4 days during September to 16 days during January. The average for the year was 6.93 days.

The number of young produced was greatest also during the month of September and reached a point almost as great in February. During the week of September 13, 1926, an average of 7.3 young per female per day was found. The lowest rate of reproduction occurred in January during very warm, dry weather. The optimum temperature was between 70 and 79° F. and 70% relative humidity. It was found that the aphids reacted most favorably to this temperature in a controlled temperature chamber. The average rate of reproduction per day for the entire year was 2.98 per female. Total young produced per female ranged from 1 to 103, being highest in September and February, with an average of 29.11 per female for the year.

[3]Eggs were abundant on wild crabapple at Monticello in extreme northern Florida during November, 1927.—Ed.

Length of Life.—The longevity ranged from an average of 11.8 days for June to 33 days for January with an average of 16.7 days. This total life can be expressed in general as a constant which is the product of the two sides of a parallelogram, one side of which represents temperature and the other length of life.

Occurrence of Winged Forms.—In many tests it was found that when aphids fed on very tender succulent foliage they all developed wingless, but when they fed on hardening foliage or on most any unsuitable host they became winged. Since all stages of foliage were always present, winged aphids could always be found, but were most abundant during March and April when most of the tender foliage was hardening.

Occurrence of Sexual Forms.—As has already been stated, no sexual forms occurred at Lake Alfred, Florida, but were present during late fall and early winter at Gainesville, Florida. There is usually a difference of 8 or 10° F. in temperature between the two points, but the writer is not able to state that this condition is responsible for the appearance of sexual forms. Work being done now under controlled temperature and humidity conditions at Gainesville, Florida, should help to solve the problem.

Economic Considerations.—As is the case among northern aphids, the more overwintering forms present, the greater will be the infestation during the next season. If each grower would so cultivate and fertilize his trees as to keep them dormant during the winter, thereby leaving no place for the aphids to live and at the same time destroy the weed host plants, he would do many, many times as much good as by spraying diligently after the aphids have become abundant during the spring. In other words, this problem, just as many others, resolves itself into one where cultural practice and timely and accurate observations will do more toward control than great quantities of insecticides.

NATURAL CONTROL

As usual, the natural control factors can be grouped into two divisions, meteorological and biological. The meteorological factors are occasionally important for winds, dashing rains, extremely high or low temperature and high humidity or very low humidity are all quite destructive to aphids. The biological factors are much more important.

Since the appearance of the green citrus aphid, *Aphis spiraecola* Patch, in Florida there have been many observations and

many speculations made as to the control derived from its natural enemies. Professor J. R. Watson and Mr. A. H. Beyer of the Florida Agricultural Experiment Station and Dr. F. R. Cole of the United States Department of Agriculture have reported aphid predators at various times. None of these papers attempted to give an estimate of the control effected by the natural enemies named. Since little data of this nature have been recorded and many broad statements as to the natural control of this aphid are made, the writer has tried to collect information that will aid in solving the problem.

Method of Study.—In order to determine the value of the natural enemies one must know when each appears and disappears, its abundance and efficiency, or how many aphids each can destroy in a definite time. Each week at Lake Alfred, Florida, 10,000 aphids were counted and all the natural enemies of this number were recorded. By continuing this through the entire year the appearance and abundance of each predator and parasite were found.

The efficiency of each predator or the number of aphids destroyed daily was found by life history and feeding records. Eggs were collected from the field or from caged adults and the larvae were reared through their complete life cycle with a record kept of all aphids eaten. The average of several individuals was taken as the correct number.

In cases where both adult and larval stages destroyed aphids, feeding records of the adults were also made and the adults were included in the counts. The work of parasites, both insect and fungous, was recorded by actual count of the aphids killed by each parasite.

The following table shows the average number of citrus aphids destroyed each day by the more important natural enemies:

Cycloneda sanguinea	26
Hippodamia convergens	61
Coccinella oculata	21
Scymnus sp.	20
Baccha clavata	33
Baccha lugens	35
Allograpta obliqua	34
Syrphus wiedemanni	45
Leucopis americana	17
Chrysopa sp.	28
Hemerobius sp.	20
Lysiphlebus testecoipes	dead aphids found
Empusa fresenii	dead aphids found

The detailed results of the work are shown in the following graphs.

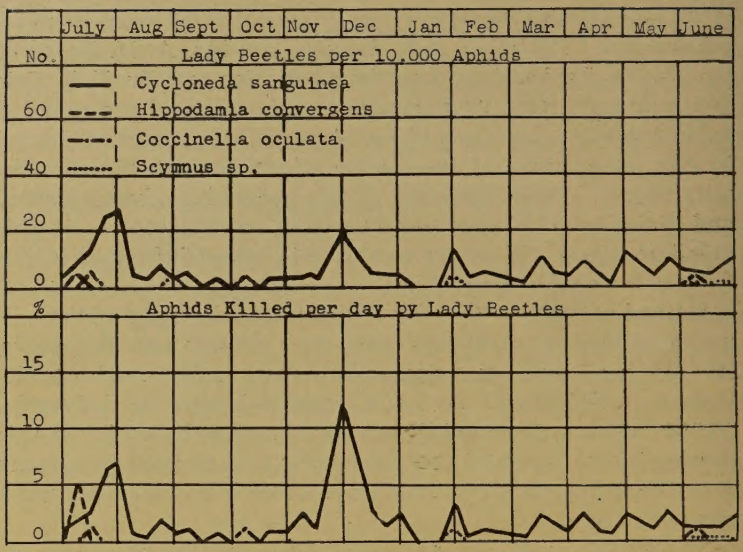


Fig. 3.—Ladybeetles, appearance, abundance and per cent of aphids destroyed daily.

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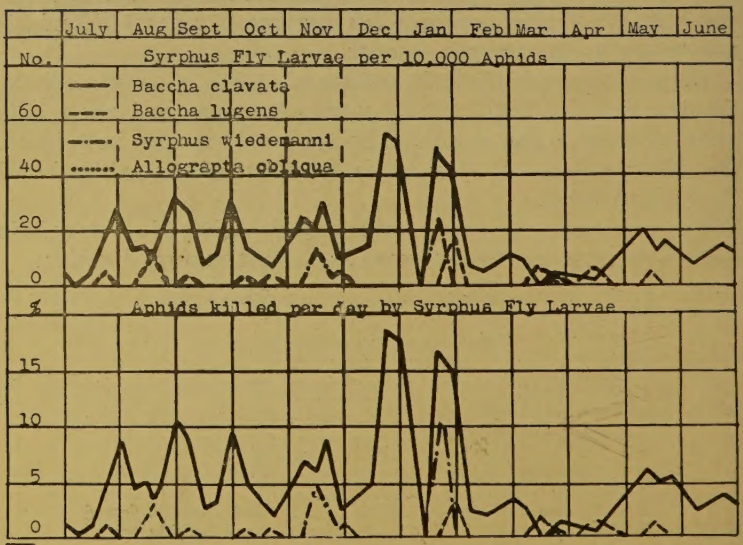

Fig. 4.—Syrphus flies, appearance, abundance and per cent of aphids destroyed daily.

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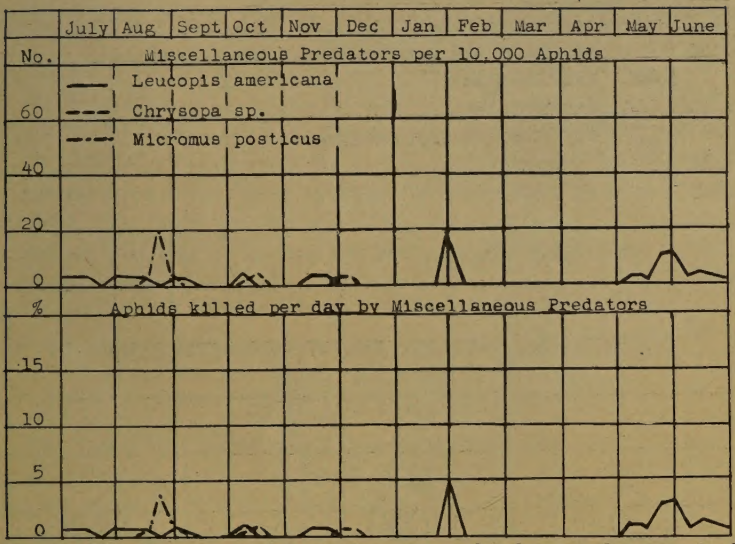

Fig. 5.—Miscellaneous predators, appearance, abundance and per cent of aphids destroyed daily.

B

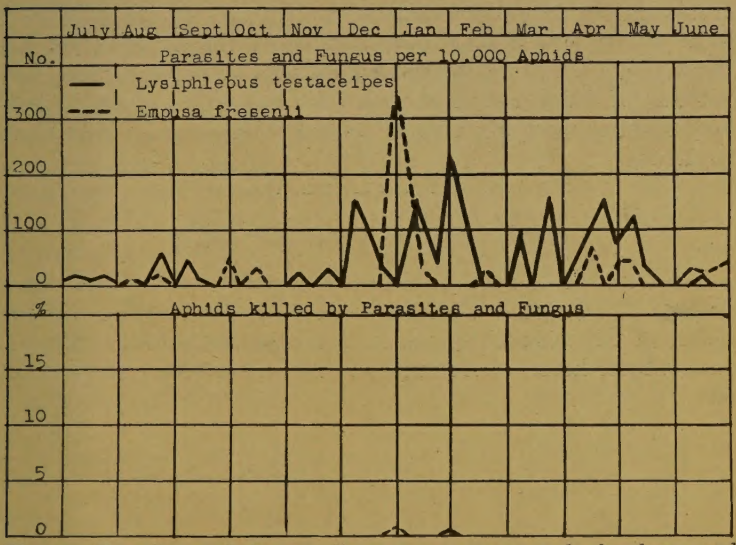

Fig. 6.—Parasites and fungus disease, appearance and abundance and per cent of aphids destroyed.

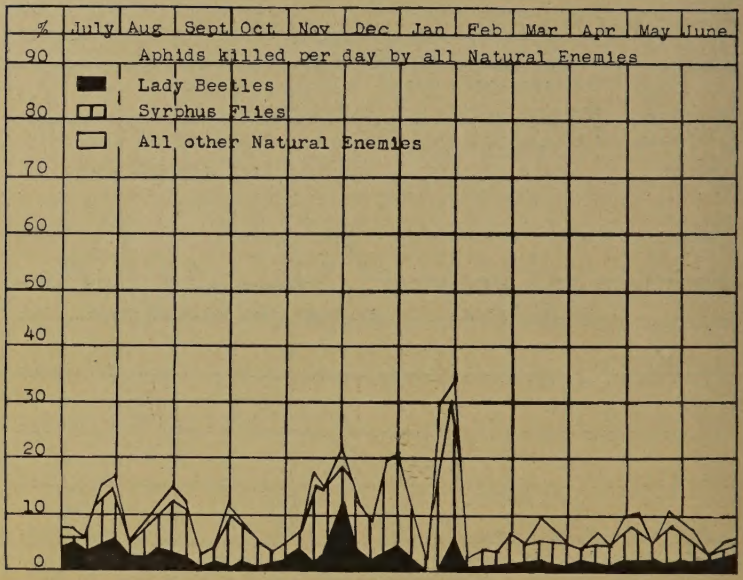

Fig 7.—Aphids destroyed daily by all natural enemies. *Cycloneda sanguinea* (blood red ladybeetle) and *Baccha clavata* are responsible for most of the aphids killed.

It can be very readily seen that when the aphids were not increasing the natural enemies were able to destroy great proportions of them; but when they were increasing at all the natural enemies were not able to control them or even hold them in check.

MRS. W. S. BLATCHLEY DIES

Members of the Florida Entomological Society and other friends of Dr. W. S. Blatchley will be grieved to hear of the death of Mrs. Blatchley which occurred in Dunedin, Florida, their winter home, on December 7. Mrs. Blatchley was 72 years old.

The

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FLORIDA LONGEVITY RECORDS OF THE COTTON BOLL WEEVIL

By EDGAR F. GROSSMAN[1]

The fact that a cotton bool weevil (*Anthonomus grandis* Boh.) lived 267 days without food in a hibernation cage, in 1922-23, together with similar occurrences during succeeding years, stimulated interest in the longevity of the boll weevil in Florida.

In an early publication[2] the following records are noted: the maximum record of longevity (period of hibernation included) of any boll weevil which was fed squares after emergence from hibernation was a total of over 335 days; the maximum number of days that a weevil lived in hibernation without food was 240 days; the maximum number of days that a weevil lived with food after emergence from hibernation was 130 days.

A later publication[3] specified that the maximum record of longevity for a specimen of *Anthonomus grandis thurberiae* Pierce was over 333 days, 270 of which were spent in hibernation. In this publication the author stated that experiments conducted at Washington, D. C., indicated that boll weevils have been kept in a dormant state for over a year, giving promise of living considerably longer.

In the fall, November 2, 1927, the present author placed 5000 boll weevils without food in a hibernation cage located in a damp and sheltered spot in the woods near Gainesville, Florida.

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[1]Contribution from the Department of Cotton Investigations, Florida Agricultural Experiment Station.

[2]The Mexican Cotton Boll Weevil, Senate Document No. 305, 62nd Congress, 2nd Session, Washington, D. C. 1912.

[3]Coad, B. R., Recent Studies of the Mexican Cotton Boll Weevil. Bul, 231, U. S. D. A. August, 1915.

LONGEVITY RECORDS OF COTTON BOLL WEEVILS CAPTURED NEAR GAINESVILLE, FLORIDA, AND PLACED IN HIBERNATION NOVEMBER 2, 1927.

Weevil Number	Date emerged from hibernation	Number days in hibernation	Date died	Number post-hibernation days	Total number days alive
1	June 15	226	July 1	17	243
2	June 15	226	July 1	17	243
3	June 15	226	July 1	17	243
4	June 15	226	July 1	17	243
5	June 15	226	July 1	17	243
6	June 15	226	July 1	17	243
7	June 15	226	July 1	17	243
8	June 15	226	July 1	17	243
9	June 15	226	July 1	17	243
10	June 15	226	July 2	18	244
11	June 15	226	July 4	20	246
12	June 15	226	July 5	21	247
13	June 15	226	July 13	29	255
14	June 15	226	July 13	29	255
15	June 15	226	July 16	32	258
16	June 15	226	July 18	34	260
17	June 15	226	July 25	41	267
18	June 15	226	Aug. 2	49	275
19	June 15	226	Aug. 11	58	284
20	June 15	226	Oct. 4	112	338
21	June 16	227	July 1	16	243
22	June 16	227	July 1	16	243
23	June 16	227	July 1	16	243
24	June 16	227	July 1	16	243
25	June 16	227	July 1	16	243
26	June 16	227	July 1	16	243
27	June 16	227	July 13	28	255
28	June 16	227	July 20	35	262
29	June 16	227	Oct. 6	113	340
30	June 16	227	Oct. 15	122	349
31	June 16	227	Nov. 5	143	370
32	June 21	232	Aug. 8	49	281
33	June 21	232	Aug. 11	52	284
34	June 22	233	Aug. 14	54	287
35	June 24	235	Sept. 3	72	307
36	June 26	237	July 3	8	245
37	June 26	237	July 3	8	245
38	June 26	237	July 20	25	262
39	June 26	237	Sept. 12	79	316
40	June 26	237	Sept. 12	79	316
41	June 26	237	Sept. 18	85	322
42	June 26	237	Oct. 29	126	363
43	June 27	238	July 3	7	245
44	June 27	238	July 3	7	245
45	June 27	238	July 3	7	245
46	June 27	238	July 3	7	245
47	June 27	238	Aug. 8	43	281
48	June 27	238	Nov. 7	134	372
49	June 29	240	July 31 (escaped)	33	273
50	June 29	240	Oct. 14	108	348
51	June 30	241	Nov. 5	129	370
52	July 4	245	Oct. 13	102	347
53	July 10	251	July 27 (escaped)	18	269
54	July 16	257	Aug. 14	30	287

Though some weevils emerged from hibernation throughout the winter, no record of emergence was kept until March 1. On this date all the weevils which were out of hibernation were removed from the cage and recorded. Daily observations and removal of those weevils which emerged continued until August 9. The last weevil to emerge appeared on July 16, having spent 257 days without food in the hibernation cage. Of the 5000 weevils placed in the cage, 11.24 percent, or 562 weevils, emerged.

In order to determine the greatest number of post-hibernation days that weevils would live, all the weevils emerging after June 14 were provided with fresh cotton squares and placed individually in lantern globes. The globes were kept in an insectary where "normal" conditions were simulated as nearly as possible.

The accompanying table gives the record of all weevils which emerged after June 14. The following individuals are of interest: weevil No. 54 which spent 257 days without food in the hibernation cage; weevil No. 31 which lived 143 days after emerging from hibernation; and weevil No. 48 which lived a total of over 372 days. This is respectively 17, 13 and 37 days longer than the previously cited records for *Anthonomus grandis* Boh.

A NEW JUNIPER APHID FROM UTAH[1]

WITH NOTES ON A FEW OTHER SPECIES

GEORGE F. KNOWLTON
Utah Agricultural Experiment Station

Minuticornicus gen. nov.

Head without prominent antennal tubercles; antennae shorter than the body, six-segmented and armed with round sensoria; front wings with the media twice branched; hind wings with both media and cubitus present; cornicles very small, wider than high, and situated on slightly swollen bases; cauda well developed, tapering gradually and armed with a number of fine sensilla; anal plate rounded.

This genus resembles *Siphonatrophia* Swain in general form but has one more segment in the antennae. *Minuticornicus* has a shorter and somewhat different type of cornicle than *Pergandeidia* Schoutenden, although the cauda is very similar.

[1]Contribution from the Department of Entomology, Utah Agricultural Experiment Station.
Publication authorized by Director, December 8, 1928.

Type *Minuticornicus gravidis* Knowlton.—This genus belongs to the tribe Aphidini.

Minuticornicus gravidis n. sp.[2]

This tiny green aphid attacks the red cedar, *Juniperus virginiana* L., apparently feeding on the scale-like needles of the smaller twigs. While abundant during June and July of certain years, no apparent damage results from the feeding.

This aphid was pointed out to the writer by Mr. A. C. Burrill,[3] who had been observing the black attending ants and was interested in knowing the name of the aphid.

The tiny cornicles, the plump abdomens of the wingless females, and the well-developed cauda are the most interesting structures of this aphid. The aphids are especially difficult to find in early June, when they closely resemble the tiny buds that are abundant on the twigs. Both the winged and wingless forms are ordinarily quite inactive, and it is especially difficult to disturb the apterous forms.

The winged forms were abundant during 1928 from June 18 until early July and then they became decreasingly abundant until mid-August. The apterous forms are present earlier but disappear at about the same time. The writer so far has not been able to find this aphid in early spring or after the first of September. Many of the wingless forms become parasitized, and the dry bodies of these individuals remain over winter on the trees.

Apterous vivipara.—Size 1.25 to 1.7 mm. long; rostrum long, extending between the third coxae; antennae greenish to slightly dusky on distal segments, and hardly half the length of the body; antennal III, 0.13 to 0.15 mm. long; IV, 0.09 to 0.1 mm.; V, 0.1 to 0.11 mm.; VI, 0.09 + 0.11 to 0.1 + 0.12 mm.; legs short and inconspicuous; hind tibia 0.45 mm. long; abdomen broadly rounded and highly arched, resembling a diminutive green pea in shape and color; cornicles hardly more than elevated pores on slightly swollen bases, usually less developed than in alate forms, and hidden from above under the broadly extended sides of the abdomen; cauda large, green to dusky, sometimes slightly constricted high up near the base, and armed with numerous fine sensilla; anal plate rounded.

[2]The writer wishes to thank Dr. P. W. Mason for his opinion concerning this form.

[3]A. C. Burrill, Curator of Missouri Resources Museum, Jefferson City, Missouri.

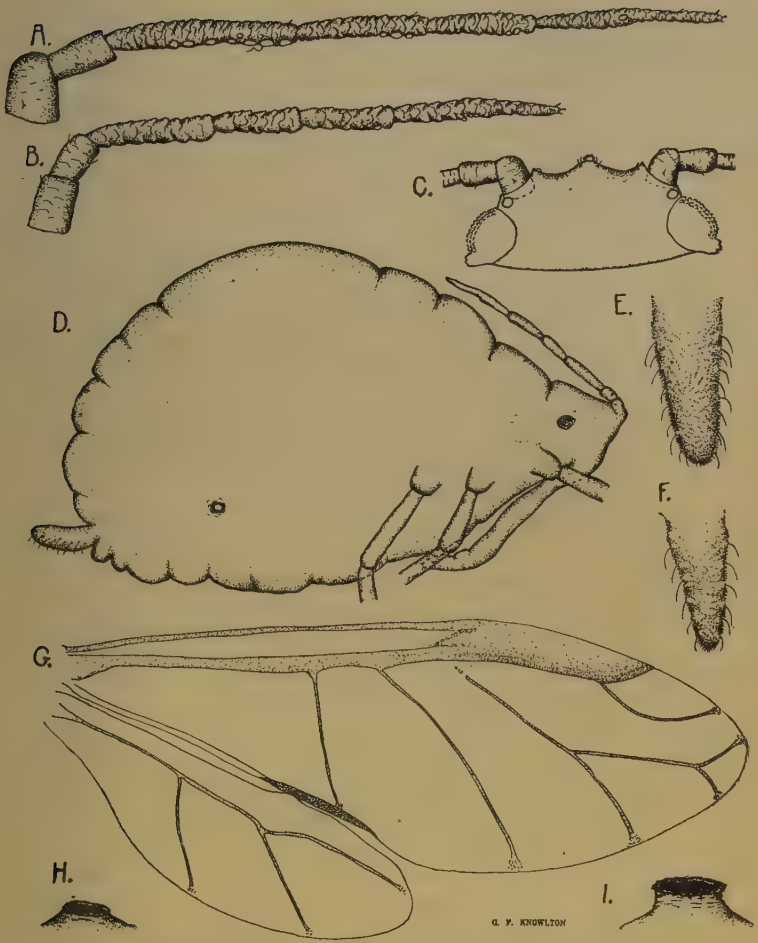

Fig. 1.—*Minuticornicus gravidis* n. sp. A, Antenna of alate female; B, antenna of apterous female; C, head of alate female; D, apterous female; E, cauda of apterous female; F, cauda of alate female; G, wings of alate female; H, cornicle of apterous female; I, cornicle of alate female.

Alate vivipara.—Size small, 1.1 to 1.6 mm. long; rostrum long, reaching between third coxae; antennae dusky, reaching to about the middle of the abdomen; antennal III, 0.17 to 0.21 mm. long and armed with 4 to 9 (usually about 7) round sensoria; IV, 0.1 to 0.13 mm., with 1 to 3 sensoria; V, 0.11 to 0.13 mm.; VI, 0.09 + 0.11 to 0.1 + 0.13 mm.; legs rather short; hind tibia

0.55 mm. long; front wings with two-branched media (but showing a decided tendency to abort the second branch in many cases); hind wings with both media and cubitus present (occasionally either is absent); abdomen moderately broad; cornicles slightly more than raised pores on moderately swollen bases; cauda prominent, dusky, tapering gradually, and armed with a number of fine sensilla; anal plate dusky and broadly rounded.

Type locality, campus of the Utah Agricultural College, Logan.

In addition to the collection of the writer, cotypes are in the collections of the U. S. National Museum and the Utah Agricultural Experiment Station.

Aphid bonnecillensis Knowlton

In examining material in the aphid collection of Mr. A. C. Burrill, two slides of this species were found, collected on the edge of Soap Lake, Washington, August 16, 1919. The writer collected this form at Malad, Idaho, on July 17, 1928.

During the latter part of September, 1928, winged and wingless forms were collected at Goshen and at Delta, Utah. These are the first fall alates collected by the writer. The wingless forms taken in the fall are a faded yellowish-green and resemble the faded leaves of the greasewood as closely as the darker spring forms resemble the darker coloring of the plant in the early part of the season.

Alate vivipara (fall migrant).—Size small, 1.12 to 1.2 mm. long; rostrum long, extending between third coxae; antenna greenish to slightly dusky and slightly more than half the length of the body; antennal III, 0.17 to 0.19 mm. long, and armed with 2 to 5 round sensoria (usually with 4 or 5); IV, 0.11 to 0.13 mm.; V, 0.11 to 0.13 mm. VI, 0.09 + 0.07 to 0.95 + 0.09 mm.; wing venation normal; legs short; hind tibia 0.45 mm. long; cornicles short, 0.067 to 0.085 mm. long; cauda long and tapering.

(To be continued)

SEMI-TROPICAL ARMY WORM OUTBREAK

The outbreak of *Xylomyges eridania* Cramer noted in our last issue persisted up into November, but the numbers of the worms gradually diminished. During November their attacks were most noticeable on snap beans for the fall market. The behavior of the worms on beans was rather characteristic. They much

preferred the young pods to the leaves of the beans. They ate large holes in the pods, much larger than the entrance holes of the corn earworm. Indeed, where the worms were abundant the pods were pretty thoroly consumed.

Some damage was also done to the fall crop of beans by the cabbage looper (*Autographa brassicae* Riley). Unlike the army worms, these caterpillars confined their attacks largely to the leaves, where they fed usually on the under side.

Due perhaps to the depredations of the Mexican bean beetle in the states further north, fall grown beans have been bringing a pretty fair price in Florida. It is quite possible that this condition may persist for several years.

THE SCARABAEIDAE OF FLORIDA

By W. S. BLATCHLEY
Dunedin, Florida

(Continued from page 46)

Subfamily TROGINAE

Oblong, convex, dull brown or blackish beetles of medium or small size covered with a thick dirt-colored crust. They have the antennae 9- or 10-jointed, club 3-jointed; elytra roughly sculptured and usually bearing rows of small tubercles; abdomen covered by the elytra; ventral segments 5, free; side pieces of the mesothorax not reaching the rounded contiguous middle coxae. They live under or about the skins and bones of carrion, old hides, feathers, etc. All our eastern species belong to a single genus.

Genus XXIII. TROX Fabricius

This genus, sufficiently characterized above, is represented in Florida by nine of the 21 known North American species. Unless cleaned of their usual encrusted coat of dirt they are very difficult to name. In the first four species the scutellum is spear-shaped and the length 12 or more mm.

76. (13328). T. scabrosus Beauv.

Length 15-18 mm. Dull blackish-brown, heavily encrusted with a brownish opaque coating; first joint of antennae with dark brown hairs, club dark; elytra with rows of oblong tubercles, which are tomentose above; between each pair of these a row of smaller tubercles and each side of these a row of granules.

"Not rare" (Sz.); St. Augustine (Ham.); Enterprise (Dietz); Sevenoaks, near Clearwater (Wick.); Lake City (Ag. Coll.).

*77. (13329). **T. monachus** Hbst.

Length 13-16 mm. Dark brown or fuscous; first antennal with reddish-brown hairs, club rufous or ash-gray; elytra each with five rows of rounded tubercles, their entire surface tomentose and with rows of granules between them.

Named without definite station (Sz. Ms.). Okeechobee City, Sarasota and Dunedin, Feb.-March (Bl.).

78. (13330). **T. asper** Lec.

Length 13-14 mm. Similar to the above, the elytral tubercles oblong, their front ends glabrous, shining.

St. Augustine (Ham.); Gulfport (Fall).

*79. (13331). **T. suberosus** Fabr.

Length 13-14 mm. Dull grayish-brown; elytra mottled with piceous, sometimes almost black, with tubercles indistinct, not tomentose.

Common throughout the State; listed from seven stations and at hand from seven others, including Jacksonville, Royal Palm Park, Big Pine Key and Everglades.

*80. (13333). **T. tuberculatus** (DeG.).

Length 9-10 mm. Black or piceous; head with a transverse row of small tufts of bristles; thorax with a deep median groove, limited each side by an entire obtuse ridge; elytral tubercles with suberect setae; hind femora with a row of spines beneath. In this and the remaining species the scutellum is oval, and length less than 12 mm.

Sanford and Dunedin, Dec.-Jan.; taken beneath the remains of carrion traps (Bl.). The first and only records for the State.

*81. (13336). **T. erinaceus** Lec.

Length 6-7 mm. Dull black, shining when clean; elytral tubercles prominent with erect black setae; hind femora without spinules beneath.

Buck Key (Sz. Ms.). Dunedin, taken frequently, Dec.-March, by sifting debris of abandoned carrion traps.

*82. (13340). **T. insularis** Chev.

Length 5-6 mm. Piceous or blackish-brown; thorax narrowed at base, bifoveate, the ridges sinuous; elytral tubercles less prominent, beset with short erect brownish setae.

Pensacola (Sloss.); Haulover (Sz. Ms.). The *T. foveicollis* Harold is a synonym.

*83. (13341). **T. terrestris** Say.

Length 5-6 mm. Very similar to **insularis**. Thorax less narrowed at base, with sides less rounded; elytral tubercles with yellow, prostrate, scale-like hairs.

"Not rare" (Sz.); St. Augustine (Ham.): Marion Co. and St. Mary (Fall); Ft. Myers (Dav.). Dunedin and Royal Palm Park;

common at Dunedin throughout the winter at carrion traps and beneath dried carcasses of dead animals (Bl.).

84. (13344). **T. scaber** (Linn.).

Length 5-7 mm. Black, feebly shining; elytral tubercles replaced by tufts of setae, these much smaller in the alternate rows; front tibiae serrulate above the lateral tooth.

St. Augustine and Lake Worth (Ham.).

Subfamily MELOLONTHINAE

The members of this subfamily vary much in size and general appearance and are primarily distinguished by having the abdominal spiracles in part situated on the superior portions of the ventral segments, the last one usually visible behind the elytra, the rows of spiracles diverging. They have the mandibles corneous, clypeal suture usually distinct; antennae 7- to 10-jointed, club lamellate, 3- to 7-jointed, often longer in males than females; pygidium exposed; tarsi 5-jointed. They are usually of looser, more slender build, with longer legs better fitted to cling to vegetation, than in the previous subfamilies. Their food habits are entirely different, as they are all vegetable feeders, the adults occurring, for the most part, on leaves and flowers, flying about in the evening and often attracted in great numbers to light, while the larvae live underground and feed mainly on roots, often doing much damage to cultivated crops.

KEY TO TRIBES OF FLORIDA MELOLONTHINAE

a. Hind tarsi with two equal claws; tarsi with a bisetose onychium between the claws; middle and hind tibiae each with two terminal spurs; body above (except in *Macrodactylus)* not scaly.

b. Labrum indistinct, connate with under surface of the clypeus; elytra with more or less distinct sulci or grooves, often iridescent; hind coxae flat, broadly dilated, last spiracle situated on the fifth ventral; length less than 11.5 mm. Genus XXIV. Tribe SERICINI.

bb. Labrum distinct, not connate with clypeus; last spiracle placed on the suture between the fifth ventral and propygidium; elytra without distinct striae or grooves.

c. Hind femora and tibiae short, much thickened; entire under surface thickly pubescent; ventral segments not connate; length 11-13 mm. Genus XXV. Tribe LIPARETRINI.

cc. Hind femora and tibiae slender; under surface, except sometimes the meso- and metasterna, not densely pubescent.

d. Ventral segments five, not connate, the sixth not visible; apical margin of thorax membraneous; form short, stout; length less than 11 mm. Genus XXVI. Tribe DIPLOTAXINI.

dd. Ventral segments six; apical margin of thorax not membraneous.

(To be continued)

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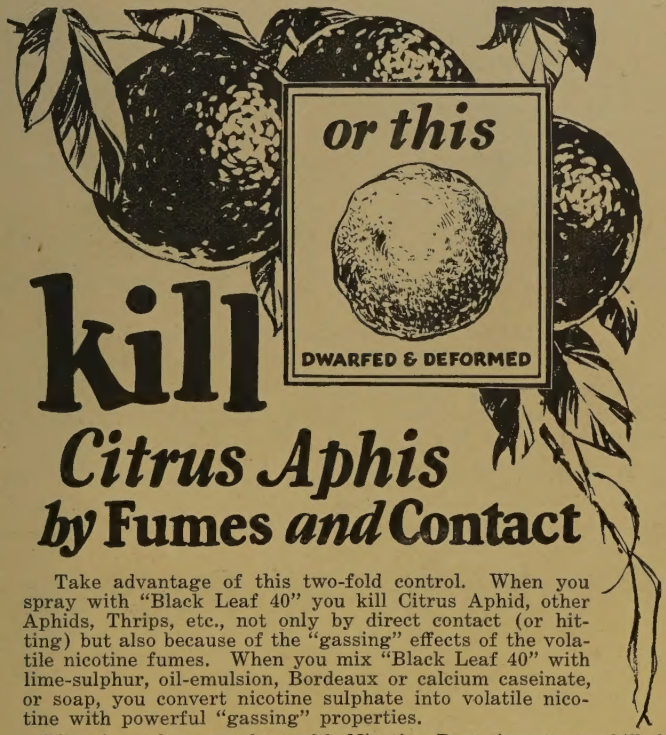

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